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Access to data from the 1958 and 1970 cohort studies was from the UK Data Archive.

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Abstract

An important question about adult education is whether it compensates for or exacerbates initial inequality. The paper looks at this question in relation to higher education in Scotland, considering inequality with respect to sex and to social class, The data come from three cohorts followed from birth to 2011-12. The oldest is unique to Scotland, consisting of people born in 1936. The other two are the Scottish components of British cohorts who were born in 1958 and 1970. This range of time allows an investigation of the effects of half a century of higher-education expansion, drawing a distinction between all higher education and degree-level higher education. The conclusions are that the proportion of women who gained any higher-education qualification was lower than that of men in the 1936 cohort right up to age 75, was equal to men's in the 1958 cohort up to age 54, and in the 1970 cohort was higher than men's from the outset and moved increasingly ahead up to early middle age. For degrees, the female proportion converged with but did not overtake the male proportion. On social class, inequality for all higher education widened with age in the oldest cohort, did not change in the middle cohort, and narrowed with age in the youngest cohort. For degrees, inequality did not change across cohorts or across ages within cohort. Thus any widening of access by adults to higher education has depended mainly on levels below that of degrees.

Key words

Higher education; sex; social class; intelligence; cohort effects; Scotland

Introduction

The influence of educational courses taken by adults on the social distribution of educational opportunity has long been ambiguous. On the one hand there has been the hope that adult education might compensate for a lack of opportunity in adolescence. On the other hand, there is the recurrent finding that people with a lot of initial education are most likely to take part in adult education.

This paper uses data from three cohort studies in Scotland to assess the extent of these contrasting potential experiences. The cohort members were born in 1936, 1958 and 1970, and so would have left secondary school predominantly in 1951-4, 1974-6 and 1986-8. They thus encountered higher education at all the stages of its massive expansion in Scotland since the 1960s from around 32,000 full-time and part-time undergraduates in the early 1960s to 233,000 in 2010 (Committee on Higher Education, 1963: 26; Paterson, 2003: 156; Scottish Funding Council, 2015: Table 1). As a proportion of the age group (under 21), the rate of participation in full-time undergraduate higher education rose from 9% in 1960 to 18% in 1980 and to 50% in 2000 (Committee on Higher Education, 1963: 26; Paterson et al., 2004: 108). Since the 1980s, the rise in participation by older students has been even greater. Up to the 1980s, the proportion of entrants to full-time undergraduate courses who were aged 21 or over was around one fifth. This rose to 35% in 2000 and to 53% in 2010, by which date 29% of entrants were aged 30 or over, and 7% aged 50 or over (Paterson, 2003: 168; Scottish Tertiary Education Advisory Committee, 1985: 39 and p. 121; Scottish Executive, 2002, Table 13; Scottish Funding Council, 2015: Table 14). In the expansion during the 1990s, the proportion of undergraduate students who took a non-degree higher-education course at a local further-education college rose to a fifth or more (Iannelli et al., 2011), a level which was maintained up to the latest data point in the present analysis (Scottish Funding Council, 2015: Table 1). This route was important in widening access (Scottish Government, 2016: 32).

Behind these numerical trends were fundamental changes in the meaning and social purpose of higher education. These drew on potentially distinctive aspects of Scottish traditions in which higher education as a preparation for entering elite social positions also depended on putatively wide social recruitment. The core of this tradition was the four oldest Scottish universities that had been founded in the fifteenth and sixteenth centuries and that had never depended on the kind of sponsored mobility that characteristised Oxford and Cambridge (Turner, 1960). Although the number of students was tiny by late-twentieth century standards, and although they were excusively male until the 1890s, they were nevertheless recruited widely from the extensive network of parish schools that the Protestant Reformation had put in place in Scotland by the beginning of the eighteenth century. As important as these schools, however, was the scope for students to attend university at all ages, studying in what would now be called a modular way (Anderson, 1983: 283-4), interrupting their attendance every few years to earn enough money to fund the next period of study.

The legacy at the beginning of the twentieth century was then a university system that, although highly socially selective, was among the more open by European standards (Anderson, 1983: 157). This potential for wide access interacted with the development of proper secondary schooling during the first four decades of the century. Although there were few policy developments explicitly for higher education after the

founding of several advanced technological colleges around the turn of the century, policy was crucial in the reforms to secondary schooling. Our 1936 birth cohort benefited from that in the late-1940s, insofar as the access to full secondary education became much more representative with respect to social class and sex (Paterson et al., 2011). They could also benefit from bursaries paid by the Carnegie Trust (Paterson, 2003: 80-1) or by local authorities (Paterson, 2018). But the social purpose of higher education was still to produce a fairly small elite, preparing the leading members of what Perkin (1989) called the new 'professional society' of the welfare state (Mandler, 2020; Halsey, 1992; McPherson, 1973). That elite was culturally homogeneous. Unlike in other countries – including England – there was no differentiation of status among the four old universities, which had been planned as a national system since the mid-nineteenth century, and which were still required to coordinate their curricula until the mid-1960s. Thus when the 1936 cohort subsequently encountered the 1960s expansion (when they were in their 20s and 30s) or the much greater 1990s expansion (in their 50s and 60s), the potential for taking up unprecedented opportunities that they had missed when young was very great.

When the 1958 cohort left school, in the mid-1970s, higher education had already experienced the 1960s expansion. So, for the first time, it could be seen as the natural route after school for high-attaining students. This was still not a mass system, but was becoming the norm for people with high measured intelligence in the most advantaged social classes. Adult opportunities for this cohort would be likely to have their greatest impact either on people from the highest classes whose measured intelligence was moderate or low, or on people at all levels of measured intelligence in other classes.

By the time that the 1970 cohort could enter higher education, the system was reasonably described as mass, with the potential to include most students with high measured intelligence from all social classes. Moreover, just as the 1936 cohort benefited from the advent of some kind of secondary education for everyone, so this cohort's chances were changed by the development of comprehensive secondary schooling, a process that embraced around 95% of Scottish pupils by the early 1980s (Paterson, 2003: 140-2). By the 1990s, moreover, the rate of entry by female school leavers was substantially higher than the rate among male leavers. So adult entry to higher education by this cohort might be said to have had the potential to realise the pre-twentieth-century ideals of open access. When very high proportions of people from the most advantaged classes were already entering by their early 20s, any adult provision would be bound to widen access socially.

A further impetus to a widening of adult participation was the fundamental changes in social class that took place after the 1960s. The decline of manual employment in manufacturing industry, and the growth of employment in the service sector, brought many more people into occupations where educational credentials could help promote careers (Paterson et al., 2004: 42-58); this was probably especially the case for women who were entering paid employment in large numbers. There are two empirical consequences of this. One is that the proportion of people who grew up in manual social classes was lower in the 1970 cohort than earlier, so that inequality harmed relatively fewer people than before. Another is that the experience of higher education was no longer as remote from most people's lives as it had been, even if they themselves had not had the chance to enter it at a young age. With more than half the population having been upwardly socially mobile from their class of origin (Iannelli and Paterson, 2006),

class cultures could not be as insulated from each other as they had been. The changing structure of the labour market also encouraged the growth of sub-degree courses of higher education, almost all of which were in vocationally specific sectors (Paterson, 2003: 166). That process also affected degree-level study, for example with nursing or primary-school teaching brought within its scope, but the changes there were less extensive. That is one reason to consider degree-level higher education separately as well as all higher education taken together.

In some respects the 1960s and 1990s expansion could be said to have been facilitated by deliberate policy, but a more plausible explanation is that policy-makers were responding to student demand, as has been shown in detail by Mandler (2020). A further consequence of unmet demand would then quite plausibly be growth of participation at later ages, as older people who were missed out in one phase of policy took advantage of the next phase. Adult participation might then be almost a by-product of policy devised mainly in response to forecasts relating to school leavers. Certainly there has been no sustained policy programme in Scotland to increase access to higher education by people beyond their early 20s (Scottish Government, 2016).

Background

Most research on inequalities of access to higher education has concentrated on entry within a few years of leaving school, partly because that is where the main policy focus has been and partly because information on social class is collected most systematically in the UK for young entrants (e.g. Boliver, 2011; Breen et al., 2009, 2010; Heath, 2000; Iannelli et al., 2011; Zimdars et al., 2009; Machin and Vignoles, 2004). If older students are included, the main attention has usually not been on them (e.g. Boliver, 2013). Although social-class inequality in educational attainment in the UK fell for cohorts born before the middle of the century (Breen et al., 2009, 2010; Heath, 2000), it has remained broadly stable for people born since then. Inequality of entry to higher education perhaps grew during the period of rapid expansion in the early 1990s, but in the late-1990s returned to the level it had been at previously (Iannelli et al., 2011). In contrast, the sex difference has been transformed. Half a century ago, a higher proportion of young men than of young women entered higher education; this reversed in the 1980s, and the relative growth of young female participation has continued to be greater than that of young men.

This paper considers people aged around 30 or older who were born between 1936 and 1970. The subject is therefore almost as close as it is possible to be to lifelong learning, insofar as we have data at age 75 on the oldest cohort.

Previous research on adult education has found it to be stratified by the same range of sociological factors as affect opportunity at earlier stages of education, but much of this research either has been cross-sectional or has looked at only one cohort. The purpose here, by using three cohorts over a variety of periods of change in policy and society, is to try to disentangle the effects of cohort and period. Bukodi (2017: 368-83) summarises prior research that used British data and which showed that relatively young adults were more likely to take part in education than older people; her own results confirm this (see also Blanden et al. (2012: 506), Boeren et al. (2010: 46), and McMullin and Kilpi-Jakonen (2014: 126)). Ormston et al. (2007: 14) found that the

decline of participation with age was greater in Scotland than in the rest of Britain (see also Field, 2009: 4, 12 and 15). A cohort-based approach can show the cumulative addition of higher-education qualifications at different stages in the life-course. Comparing cohorts can show the effects of social change or policy change on this age distribution.

A second dimension of stratification is sex. In contrast to the very clear patterns of change in sex differences among young people, there has been no clear conclusion for older ages. Boeren et al. (2010: 46) found only small sex differences when grouping all ages from 25 to 64, Ormston et al. (2007: 15) reported, for people aged 16 to 69, that the rate of participation was higher among men than among women, while Dämmrich et al. (2014: 43) found the opposite for people aged 25 to 64. If different cohorts have different sex differences, then this ambiguity might be due to not distinguishing among cohorts.

Much more consistent findings have been reported for socio-economic status. People of lower-status origins, or in lower-status positions themselves, have been found to participate in lower proportions than people with higher-status connections (Blanden et al., 2012; Boeren et al., 2010: 49; Bukodi, 2017; Brunello, 2001: 2; Elman and O'Rand, 2004: 152; Field, 2009: 12-16; Jenkins et al., 2003: 1712; Ormston et al., 2007: 18; Rubenson, 2006: 332). Nevertheless, the findings on socio-economic status have also suggested that the relationship with education might change. Rubenson (2006: 332), while noting that the Nordic countries follow the common pattern of higher participation by people with high levels of initial education, also notes that this inequality is less there than in other countries. That suggests an interaction with policy. Dämmrich et al. (2014: 35 and 42-9) found that in some countries low-educated people have higher participation than high-educated people, whereas in others the difference is reversed. Kilpi-Jakonen et al. (2012: 55-6) found, for Britain, that people with middling amounts of education are more likely to upgrade their qualifications than people with either high or low prior attainment.

Our analysis is similar to that by Bukodi and Goldthorpe (2012), but also differs in two ways. They used British cohorts born in 1946, 1958 and 1970, whereas our Scottish data allow the history to be taken back to people born in 1936. We also consider a longer span of ages. They looked at attainment by age mid-30s, whereas we consider attainment up to more recent time points – age 75 for the 1936 cohort, 54 for the 1958 cohort, and 42 for the 1970 cohort. The 1946 cohort could not reliably be used to analyse Scotland for these purposes, because its sample size there was only 656, and because it has not asked about educational attainment after age 43.

In each of the cohorts we consider social-class and sex differences with and without control for intelligence measured at age 11. Many studies of inequality in access to higher education in the UK take no account of measured intelligence, which is reasonable if the intention is to describe overall patterns of social difference, but cannot tell us how the higher education system selects its entrants (Deary et al., 2005). With a measure of intelligence, we are able to say whether merit-selective pressures were greater at one time than at others, or were greater for some social groups than others. Machin and Vignoles (2004: 119) and Galindo-Ruedo and Vignoles (2005) concluded that, between the 1958 and 1970 cohorts, intelligence became less strongly associated with attaining a higher-education qualification, and thus that social class of origin (and income) became more important. Lindley and McIntosh (2015) found that the students

who benefited most from the expansion after the 1980s had lower average cognitive ability than those who would have entered university in previous periods.

Machin and Vignoles (2004: 121-2), like Bukodi and Goldthorpe (2012), concluded that educational inequality widened between the 1958 and 1970 cohorts. Our longer age-span allows us to consider whether attainment among older respondents changes that conclusion about inequality. The importance of considering long-term follow-up of cohort studies is explained by von Stumm et al. (2010 p. 203). Elman and O'Rand (2004: 151), likewise, point out the importance of going beyond respondents' 20s if we are to understand the effects of origins on the lifecourse. Huang et al. (2019) found that, after the higher-education expansion of the 1990s, the economic benefit of completing a higher-education course was greater for people who returned to higher education after a period in the workplace than for those who entered straight from secondary school. Hällsten (2012) found in Sweden that the benefits of later participation in higher education were stronger for women than for men, and for people currently in the middle of the earnings distribution than for those earning more.

Our aim, arising from the prior research and policy changes, is thus to understand social-class and sex differences in acquiring higher-education qualifications by people aged around 30 or older in the period since the early 1960s. The specific research questions are:

1. To what extent did people acquire higher-education qualifications in this age range, and did this change with birth cohort?
2. Did increased participation by older students compensate for or exacerbate initial inequality with respect to sex, and did this vary according to when people were born?
3. Did increased participation by older students compensate for or exacerbate initial inequality with respect to social class, and did this vary according to when people were born?
4. Did the answer to the question about class differ between men and women?
5. Did the answer to any of these questions vary by the level of higher education (degree or sub-degree)?

Methods

Data

1936 cohort

There are two sources of data from the 1936 birth cohort which was first surveyed in 1947. One comes from the original annual follow up of a random sample from that cohort to 1963, the other from linkage to census data since 1991. Both of these may be thought of as extensions of the Scottish Mental Survey of 1947, which was conducted by the Scottish Council for Research in Education, surveying almost all 11-year-olds in that year (Huang et al., 2016; Macpherson 1958). Children born on the first day of the even-numbered months were tested cognitively, and then were followed up annually until 1963. These 1,208 pupils are our first source of data for the 1936 cohort. To measure educational achievement in later life, the surviving and traceable members of the full Scottish Mental Survey were linked by the Longitudinal Studies Centre Scotland to the Scottish Longitudinal Study (Huang et al., 2016). The SLS is a 5.3%

semi-random sample of records (members selected as having one of 20 birthdays) from the population censuses of 1991, 2001 and 2011

1958 and 1970 cohorts

The National Child Development Study and the British Cohort Study seek to follow almost everyone born in Britain in, respectively, a specific week in early 1958 and in early 1970. Respondents were included here if they were living in Scotland at the first sweep. The survey sweeps used are 1981, 1991, 2000, 2004, 2008 and 2012 for the 1958 cohort, and 1996, 2000, 2005, 2008 and 2012 for the 1970 cohort.

The variables used in the analysis were:

Sex

Information was taken from the birth sweep.

Class of origin

1936 cohort, age 27: the social class of the father's occupation in 1947 was derived from the 1951 Classification of Occupations.

1936 cohort, later ages: Origin class was obtained by further linkage to the 1939 National Register that was created as a preparation for wartime requirements. Information on the head of household's occupation in the Register was coded for the SLS to the 'Historical International Standard Classification of Occupations' (van Leeuwen and Maas, 2011). This was in turn condensed into an approximation to the seven-class Goldthorpe scheme (Zijdeman and Lambert, 2010; van Leeuwen and Maas, 2011).[1] These categories are shown in Table 1. For most purposes, we combine categories I and II. This measure is only an approximation to the Goldthorpe classification, on two grounds: the original data were collected for administrative purposes during the emergency of wartime, not as part of a research project (unlike all the other variables which we use here), and the 1939 Register did not include information on the status of respondent's job, with the consequence that the 'unclassified' category is larger and more heterogeneous than in the later cohorts. We discuss the validity of the 1939 class measure in online Appendix 1, concluding that, apart from the larger unclassified category, it is probably as valid as the other measures which we use.

*** Table 1 here ***

1958 and 1970 cohorts: In order to be as close as possible to the 1936 cohort, this was based on father's socio-economic group in the age-0 sweeps. The socio-economic groups were converted into Goldthorpe classes as recommended by Goldthorpe and Jackson (2007, Table I; see also Heath and McDonald, 1987: 368). A version of class of origin in terms of Registrar General's class was also available from the same sweeps.

Class of origin for these cohorts has more commonly been based on measures at adolescent ages. In the online Appendix 2 we report the result of using that measure in the 1958 and 1970 cohorts, showing that the conclusions are close to those reported below.

[1] The author is grateful to Professor Paul Lambert for kindly supplying the SPSS code which carries out this mapping.

Intelligence

Ideally we would have had the same test on each occasion, but having to reconcile different measures is the price that is paid for being able to compare over a long period. The measure available are:

- 1936 cohort, age 27: Form L of the Terman-Merrill revision of the Stanford-Binet scale, at age 11 (Deary et al., 2009);
- 1936 cohort, later ages: Moray House Test No. 12, administered to the whole Mental Survey at age 11 (Deary et al., 2009);
- 1958 cohort: test of general cognitive ability at age 11. Shepherd (2012: 6) explains that this test consisted of 40 verbal and 40 non-verbal items, and that children were tested individually by teachers. The resulting scale had a reliability of 0.94, and had a correlation of 0.92 with an 'IQ-type test used for secondary school selection'.
- 1970 cohort: tests from the British Ability Scales at age 10, using the mean of the scores on the word-definitions, similarities and matrices scales (Elliott, Murray and Pearson, 1978).

Because the tests are different, we standardise each of them to have mean 0 and standard deviation 1 in the sample. Goisis et al (2017: 87) did the same for the 1958 and 1970 surveys to investigate the association between low birth-weight and intelligence, noting that the standardisation is equivalent to ranking the children by intelligence within cohort. By standardising the measures within year, we also will have controlled for any changes over time in average scores. Although we will continue to refer to this measure as 'intelligence', it is better described as 'relative intelligence', where the comparison is with peers within the same year of birth. An advantage of using intelligence is that it allows a finer differentiation of potential to benefit from higher education than would school attainment, especially for the oldest cohort where only a small minority of school leavers received any public examination certificate (around 12%: Macpherson, 1958: 52). This variable is thus being used as a control for the combined effects of schooling, family environment, and genetic endowment. It is thus an indicator of the many ways in which these influence the chance of entering higher education in a somewhat merit-selective system.

Educational attainment

The dependent variable in the analysis records attainment of a higher-education certificate. We measure this in two ways – attaining a degree-level certificate, and attaining that or a sub-degree certificate at the higher-education level. Each of these was recorded as the highest attainment of respondents at each of the sweeps. This variable was thus, by construction, cumulative. Respondents with missing data on the variable were omitted, unless they had supplied information on their educational attainment at a previous sweep.

There are several reasons to include both degrees and sub-degrees. One is that, as noted above, a large part of the expansion of higher education in Scotland after the 1970s was at the sub-degree level. Financial returns to sub-degree attainment are positive, although generally lower than to degrees (Blundell et al., 2000; McIntosh, 2006). We do not have information on how the respondent obtained any higher-

education qualification, for example at what institution or by full-time or part-time study. Nevertheless, there is evidence that, in the UK at least up to the first decade of the present century, the institution attended made little difference to economic rates of return after controlling for selectivity (Chevalier, 2014; Hussain et al., 2009). Part-time study in the UK has been shown to be associated with a rise in earnings after graduation that is at least as great as that of full-time study (Callender and Thompson, 2018: 55).

Attrition

When using cohort studies, the main threat to validity is attrition. The age-27 sweep of the 1936 cohort retained 91% of the original sample members. The linkage of the 1936 cohorts was successful for 95% of cases for the 1939 social class data (not counting people who had left Scotland before the first sweep of the Scottish Mental Survey in 1947), and 87% for the link to the Scottish Longitudinal Study. This yielded a sample of 2,531 in 1991, or 64% of the people in the 1936 cohort who were eligible to be in the 1991 SLS (Huang et al., 2016: 9 and 18). Of these, 83% were included in the 2001 sweep of the SLS, and 65% in the 2011 sweep, representing therefore 53% and 42% of the original eligible members. There is some weak evidence of differential meritocratic migration out of Scotland. In the age-27 sweep of this cohort, 12% reported having a higher-education qualification, whereas in 1991 the linked sample reported 9% (p-value for difference of 0.01).

In the other two cohorts, there were respectively 1,985 and 1,617 living in Scotland at birth. Of these, respectively 1,365 (69%) and 1,143 (71%) had information on educational attainment for at least one of the relevant sweeps. These rates are quite high, essentially because we force the attainment data to be cumulative. Because the models included intelligence, which Nathan (1999) and Hawkes and Plewis (2006) found to be the main predictor of non-response in longitudinal studies, the problem of bias due to attrition is probably not severe. Nevertheless, any association of attainment with intelligence will be measuring propensity to respond as well as the true relationship between intelligence and attainment. Selective non-response might tend to attenuate this relationship. On the other hand, since the cumulative response rates are similar in the 1958 and 1970 cohorts, and in the 1936 cohort in 1991 (respectively 69%, 71% and 64%), it might be reasonable to assume that comparison of the measured association between intelligence and attainment involving these sweeps might implicitly have controlled for selection bias. We present information in online Appendix 3 which suggests that this reassurance also applies to the 2001 and 2011 sweeps of the 1936 cohort, despite the lower response rate there.

Comparison with rest of Britain

Although the main empirical focus of the analysis is on change over a long period of time in Scotland, enabling us to reach back to people born in 1936, we also use the full Britain-wide cohorts to consider in online Appendix 4 the extent to which Scottish experience might have been distinctive, concluding that any distinctiveness relates to the timing of certain social changes (notably in relation to sex), not to whether they were reflected in entry to higher education.

Statistical models

There are four sets of models, the first looking at age within cohort, the other three comparing cohorts at specified ages:

1. For all three cohorts we can compare the time points of the early 1990s, the turn of the century, and around 2011-12; for the 1958 and 1970 cohorts, we have a more finely grained collection of years within that period; for 1958 we also have a time point in 1981.
2. Because we have approximately age-30 information for all three cohorts, and because two of the corresponding dates (1963 and 1991) happen to coincide with the points where the two major recent expansions of higher education started (Boliver, 2011: 232), we can ask whether having these successive new opportunities made a difference to the respondents in their 20s: at that age, only the 1958 cohort could benefit from the 1960s expansion and only the 1970 cohort could benefit from the 1990s expansion.
3. Comparing the 1970 and 1958 cohorts at age 42 allows us to assess whether, after the massive expansion of higher education in the 1990s, the somewhat stabilised system in the following decade continued to have an effect on the social distribution of opportunity.
4. Comparing the 1958 and 1936 cohorts at age 54-55 allows a summative assessment of the effect on adult opportunities in higher education of the whole period of expansion that started in the early 1990s, because, at that age, this expansion had been available to the 1958 cohort but not to the 1936 cohort. If most participation takes place at a young age, then we might expect less room for further expansion of participation in the 1990s in the 1958 cohort – which had the opportunity to benefit from the 1960s immediately upon leaving school – than in the 1936 cohort, which could take part in that earlier expansion only from around age 30 onwards.

We use two strategies for modelling the data. For analysing age, we treat the structure of the data as being repeated measures on the same individuals over time. We do this by means of a linear mixed-effects model. Denote by y_{ijt} the dichotomous variable which takes the value 1 if person i in cohort j in year t has a higher education qualification, and 0 otherwise (with separate dichotomous models for degrees, and for any higher-education qualification). The dependent variable y is modelled as a linear function of cohort, year, and a set of explanatory variables, with error terms for person and for time point within person. The model is:

$$y_{ijt} = b_{0j} + b_{0t} + b_k x_{kijt} + \ldots + u_{ij} + e_{ijt}$$

Here, b_{0j} is the average graduation rate in cohort j, b_{0t} is the average graduation rate in year t, and x_{kijt} denotes explanatory terms (indexed by k), which might also include interactive terms involving cohort and year. The random term u_{ij} records unmeasured unique characteristics of respondent i in cohort j; its inclusion specifies correlation between the successive measurements on that person. The random term e_{ijt} refers to unmeasured unique features of that person only at the specific year t. The u terms and e terms are uncorrelated and have Normal distributions with mean 0 and standard deviations respectively σ_u and σ_e. This model was fitted, using maximum likelihood, by the package 'lme4' in R (Bates et al., 2015).

For comparing cohorts at single ages, the model is a standard multiple linear regression, in other words the equation displayed above without the term u and without the suffix for year. This modelling was done using the package 'lm' in R.

In both kinds of models, terms were fitted in the sequence shown in the tables, proceeding from lower order to higher order. However, in practice, varying the order made no difference to the statistical significance of terms. Both kinds of models are summarised below using analysis-of-deviance or analysis-of-variance tables and predicted proportions with a higher education qualification at specified values of the explanatory variables. The predicted proportions used the 'predict' function in R, and the graphs were drawn using the package 'ggplot2'.

Results

We present first the results for analysing the outcome of attaining any higher-education qualification. Then we summarise the ways in which these results do and do not differ from those for attaining a degree.

Change by age within cohort

For the 1958 cohort, summary results are in Table 2. The interaction of year and origin class has a reduction of deviance of 23.0 for 25 degrees of freedom (p=0.58). Thus the stratification in graduating by age 54, in 2012, is the same as in 1981, even though the proportion in the sample who graduated grew between these ages from 21% to 34%. In contrast, there is clear evidence in Table 2 of change in the difference with respect to sex (p=0.017) and to intelligence measured at age 11 ($p < 0.001$). When the cohort was aged 23 (in 1981), for people of average intelligence, 16% of men and 19% of women had graduated; there was no gap in 1991, and then the gap in favour of women was stable at about 4-5 points from 2004. The change with respect to intelligence is illustrated in Figure 1 for two selected classes: for both men and women, the slope against intelligence became steeper with time because, in this cohort, people with high intelligence were more likely to graduate as they aged than people with average or low intelligence.

*** Table 2 here ***

*** Figure 1 here ***

The pattern for the 1970 cohort is summarised in Table 3. In contrast to the 1958 cohort, there is no evidence of any change in the slope on intelligence, as the overall rate of graduating grew from 34% in 1996 to 42% in 2012. There is now some evidence of change over time in stratification with respect to origin class: the p-value for the deviance of 30.0 on 20 degrees of freedom is 0.06. But this change varied by sex (deviance 34.3 on 20 degrees of freedom; p=0.02), as Figure 2 illustrates for classes I&II and VII: for people of average intelligence, class inequality declined for women between 1996 and 2000, but not clearly for men; class inequality was stable for both sexes after that. There was no evidence of any such three-way interactive effect in the 1958 cohort when that term was added to the final model in Table 1 (deviance of 22.5, on 25 degrees of freedom; p=0.61), which suggests that, in the 1970 cohort, the effect is one of age and period: young women of lower-class origins in their late 20s in the 1990s were taking advantage of the unprecedented expansion of higher education then, whereas women of similar age and class in the 1980s (from the older cohort) did not do so.

*** Table 3 here ***

*** Figure 2 here ***

For comparison with any effect of age in the 1936 cohort, we can use only the time points 1991-6, 2000-1 and 2011-12. The summary results including all three cohorts are in Table 4. During these years, the proportion of people who graduated grew from 9% to 14% to 17% in the 1936 cohort, from 29% to 31% to 34% in the 1958 cohort, and from 34% to 36% to 42% in the 1970 cohort. There is certainly no evidence in these percentages that the tendency to acquire a higher-education qualification after people's mid-20s declined with cohort. However, it is also true that, using information from the earliest survey sweeps after respondents were in their mid-20s, at least seven out of ten people who had attained a higher-education qualification by the time of the most recent sweep had done so by that young age: about 12% compared to 17% in the 1936 cohort, 29% compared to 34% in the 1958 cohort, and 34% compared to 42% in the 1970 cohort – respectively therefore 71%, 85%, and 81%.

*** Table 4 here ***

Although in Table 4 there are now several interactive effects with respect to social class, sex and intelligence, the main point to note is that there is strong evidence of change with year in the class inequality: the three-way interactive effect of cohort, year and origin has deviance 40.0 on 20 degrees of freedom ($p=0.001$). In Table 4, there is also evidence of change over time in the sex difference (deviance 9.60 on 2 degrees of freedom; $p=0.008$) and in the difference with respect to intelligence (deviance 20.8 on 2 degrees of freedom; $p < 0.005$).

Figure 3 illustrates the changes with respect to class for people of average intelligence. In each of the graphs in the Figure, the lines correspond to the three years – solid for 2011-12, broken for 2000-1, and dotted for 1991-6. With the exception of the daughters of the small self-employed class IV in the 1936 and 1958 cohorts, the persistently high attainment of class I&II stands out. In the 1936 cohort, that class increased its advantage over the two decades. That was not the case in the 1958 cohort, where the class differentials were essentialy stable between 1991 and 2012. In the 1970 cohort, the class advantage diminished to such an extent that the lower classes had, by 2012, caught up with the intermediate class III.

*** Figure 3 here ***

One consequence of the main patterns in this Figure is that, whereas initial inequality was greater in the 1970 cohort than in the 1958 and 1936 cohorts, that was no longer the case after two decades of adult participation in higher education. If we were to look only at attainment in 1991-6, we would conclude that the 1970 cohort was the most unequal. For example, for women in that cohort, this model estimated higher-education proportion to be 48% in class I&II and 17% in class VII, a gap of 31 points. The corresponding gap in 1991 for the other two cohorts was 29 points for the middle cohort and 13 points for the oldest cohort. But by 2011-12, the relative position of the 1970 cohort had been reversed. The gap was 18 points in the 1970 cohort, 22 in the middle cohort, and 21 in the oldest cohort.

Figure 4 illustrates for two origin classes in 2011-12 the change across cohorts of attainment with respect to intelligence (39.9 on 2 degrees of freedom in Table 4, $p=0.005$). The solid line is class VII, the dotted line class I&II; the slope is steeper for the higher class. That is, intelligent members of the higher class were more able to take advantage of opportunities in higher education than intelligent members of the lowest class. Intelligent members of the class VII in the 1936 cohort attained no better than

members of the class I&II who had intelligence at one standard deviation below the mean. In the 1958 cohort, intelligent men of class VII could almost equal men of average intelligence in class I&II; intelligent women of the class VII emulated this in the 1970 cohort.

*** Figure 4 here ***

Two other features of Figure 4 are important. One is that the effect of intelligence is generally stronger in the middle cohort than in the other two, noting that all the vertical axes have the same scales. That is, as higher education expanded after the 1960s, the people with above-average intelligence in the 1958 cohort took first advantage, stretching their lead over people with below-average intelligence. The further expansion of higher education in the late-1980s and 1990s led to a shift upwards in the left-hand ends of the lines in the 1970 graphs compared to the 1958 graphs, in other words a disproportionate effect on people of below-average intelligence.

The other notable feature of Figure 4 is that women moved from being behind men at all levels of intelligence and social class in the 1936 cohort, to being approximately equal in the 1958 cohort, to being clearly ahead at all levels of intelligence and class in the 1970 cohort.

In short on the question of age, the main conclusion is that higher education attainment between respondents' mid-20s and early 40s compensated to some extent for original inequality in the 1970 cohort, especially for women at levels below the highest class I&II. There was no such compensation in the 1958 cohort between the mid-20s and the mid-50s. In the 1936 cohort, higher education attained between mid-50s and mid-70s probably exacerbated prior inequality. Thus any claim of growing inequality between the 1958 and 1970 cohorts has to be set in the context both of preceding cohorts and of age within cohort. On sex, the main difference is that women were behind men in the 1936 cohort, equal to men in the 1958 cohort, and ahead of men in the 1970 cohort. On intelligence, inequality was greater in the middle cohort than in the other two. That is, merit-selective pressures may have been greatest in the cohort that experienced the first effects of the expansion of higher education.

Change between cohorts

Disentangling cohort and period effects requires that we hold age constant. The first such comparison of cohorts is in Table 5, which compares all three cohorts at age around 30. The notable features of the table are the average effects of sex, the interactive effect of cohort and intelligence, and the absence of any interactive effect of cohort with sex or class. Predicted values illustrating these points are shown in Figure 5. The most salient aspect of the class gradient is parallel in the three cohorts – the steep gradient across classes I, II and III, and the generally only weak slope across III, IV and V. As in the analysis of the period 1991-6 to 2011-12, there is evidence from Table 5 of a stronger statistical effect of intelligence in the 1958 cohort than in 1936 ($p=0.014$): its slope was respectively across the cohorts 0.126, 0.161, and 0.153 (p-values 0.04 for 1936 v. 1958 but 0.73 for 1958 v. 1970).

*** Table 5 here ***

*** Figure 5 here ***

The benefit which women gained from the 1990s expansion was probably already evident by age around 30 when that expansion was able to affect only the 1970 cohort: in the middle panels of Figure 5 (average intelligence), for example, male and female rates were very similar in the 1936 and 1958 cohorts, but women were 7 points ahead in the 1970 cohort ($p=0.10$ for comparison of the sex differences in 1970 and 1936).

At age 42, there is still no evidence of any difference between the cohorts in stratification with respect to class, as summarised in Table 6. As at age around 30, there is evidence of a sex difference ($p=0.005$), but not of any cohort difference in it. Nevertheless, there is no evidence of a sex difference in the 1958 cohort (estimate of 3 percentage points; $p=0.24$), in contrast to the estimate for the 1970 cohort (9 percentage points, $p=0.059$). That is, the expansion of the 1990s affected women born in 1970 but not those born earlier.

*** Table 6 here ***

The final way in which we can control for age is to compare the 1936 and 1958 cohorts at ages around 55. Table 7 shows that there is still no evidence of a change in stratification by class ($p=0.25$). Thus there is no evidence that the 1990s expansion allowed any compensation in social-class inequality in the 1936 cohort for not having been able to take advantage of the 1960s expansion at a young age. At age around 55, there was clearly a stronger relationship with intelligence in the 1958 cohort than in the 1936 cohort: the slope in the 1958 cohort was 0.18, steeper than the slope of 0.084 in the 1936 cohort ($p < 0.001$ for the difference). Thus we have reached the same conclusions as noticed at several points above where the slope on intelligence appeared steepest in the 1958 cohort. There is also evidence that the sex difference at age around 55 differs betweeen the 1958 and 1936 cohorts ($p < 0.001$). Men were 4 percentage points ahead of women in the 1936 cohort, but 5 points behind in the 1958 cohort. This contrasts with the situation at age around 30 (Table 5), when the average sex difference for people of average intelligence did not differ between these two cohorts.

*** Table 7 here ***

Degree attainment

The conclusions from analysis with degree attainment differed in three important ways from the analysis of any higher-education attainment. (Tables and graphs for degree attainment are in online Appendix 5, and below in Figure 6.) As a preliminary, it is relevant to note that degree-level attainment at older ages was unusual in the oldest cohort, but became more common: thus the proportion of all people with degrees by the most recent sweep who had earned them by age about 30 was, in the three cohorts, respectively 31%, 72% and 84%, in contrast to the analogous proportions for any higher education of 71%, 85%, and 81%.

First, the disproportionate gains by people of lower social-classes origins were confined to sub-degree attainment. In a version of Figure 2 for degrees, there was no convergence of the lines for the two class groups as people aged in the 1970 cohort. In the 1958 cohort, the class gradient after controlling for intelligence also did not change, just as for the analysis of any higher education.

Second, the same was true when comparing the cohorts: there was no change in the class gradient across the cohorts. In contrast to Figure 3, the class gradient for degrees did not weaken in the 1970 cohort. Again, the conclusion is that people of low-class

origins made gains only in relation to higher education below the level of degrees. The advantage of women from class IV was more pronounced than in Figure 3, and persisted into the final cohort.

Something similar was true with respect to intelligence and sex. The slope of degree attainment on intelligence did not differ between the cohorts (unlike in Figure 4): thus selection in the 1958 cohort was neither more nor less meritocratic than earlier or later. The sex difference changed much less across the cohorts than for any higher education, with women coming to equal men in the 1970 cohort, rather than overtaking them.

Third, one insight into how the highest classes benefited from the expansion is found in the analysis of degree attainment at ages around 30. In Figure 5 above, class I was further ahead of the other classes in the 1958 cohort than it was in the 1936 cohort, maintaining that advantage in the 1970 cohort. For degree attainment, Figure 6 below shows that class I did not move so sharply ahead until the 1970 cohort. We can infer that, in the first phase of the expansion (benefiting the 1958 cohort by that age, but not the 1936 cohort), the highest class increased its advantage by participating in the expansion of all levels of higher education, whereas in the second phase (benefiting the 1970 cohort at that age, but not the 1958 cohort) the highest class maintained its advantage mainly through degree-level courses.

*** Figure 6 here ***

Conclusions

The main aim of this analysis was to investigate whether and to what extent acquiring a higher-education qualification when people were aged older than their mid-20s has affected sex and class differences in that attainment. The analysis has been methodologically distinctive in being able to assess three cohorts measured at many ages over a long period of time, born 1936, 1958 and 1970, with attainment measured from their late-20s to, respectively, their mid-70s, mid-50s and early 40s. This length of time was possible only by confining attention to Scotland, but (in online Appendix 3) we have summarised reasons to believe that, in most respects, the results would apply also to the rest of Britain.

On the research question 1, prior research would lead us to expect that the rate of growth in the proportion with a higher education qualification would decline with age. Certainly, for each cohort, at least seven out of ten people who had acquired a higher-education qualifications by 2011-12 had done so before their early 30s. But, after that age, there was no evidence of a decline in the rate of growth of attainment of higher-education qualifications in general with age or by cohort. But there was a change with respect to degree (question 5). In the older cohorts, degree completion was more common at younger ages (up to around 30) than at older ages, in contrast to sub-degree courses. That difference was much less in the 1958 cohort, and vanished in the 1970 cohort.

On sex differences (question 2), the ambiguous findings in previous research suggested a need to control for cohort, not just for age. That clarified a straightforward pattern. For higher education as a whole, at all ages, women moved from having lower participation than men in the 1936 cohort, to being equal in 1958, and to being ahead in 1970. For degrees, women reached parity with men rather than going beyond them (question 5). One reason for this will have been changing sex differences in attainment

in the senior years of secondary school, where the average among girls overtook the average among boys in the early 1980s (Burnhill et al., 1988). But probably more important at older ages, especially for comparison with the 1936 cohort, are changing patterns of child-rearing. Joshi (2002: 449) showed (from the 1958 and 1970 cohorts, along with the 1946 cohort) that the percentage of women who became mothers by age 26 fell sharply over time, especially among women who already had a higher-education qualification. Thus, for women who had children after that age, this would have pushed to a later age than previously the opportunity to have time to take a higher-education course. Nevertheless, we also found that the sex difference was already evident at age 30 in the 1970 cohort (7 points in favour of women at average intelligence), and probably did not grow by age 42 (9 points). So despite a higher proportion of women than before having small children to look after in their late-20s, women as a group still managed to gain a higher-education qualification at a higher rate than men. Only more detailed information on women's spacing of children in the three cohorts would allow the explanation to be taken further.

On social class (question 3), previous findings for many countries suggested that adult education tends to reinforce early inequality. For higher education as a whole, our analysis confirmed this for the oldest cohort. The 1958 cohort showed no change in class inequality between their early 30s and mid-50s. But, contrary to the prior research, in the 1970 cohort higher education acquired between their late-20s and their mid-40s compensated to some extent for class inequality at younger ages, especially for women at levels below the highest class I&II (question 4). For degree-level attainment, however, there was no such equalising with age in the later cohort: the class gradient did not change with age in any of the cohorts (question 5). As we noted earlier, some of this change may be due to the changing nature of class. This is not so much a matter of any change in the meaning of the categories of class: the historical class scheme which we have used was developed in an attempt to maintain some stability of meaning over time. The question is more a matter of class cultures. In a more fluid structure of employment, where absolute social mobility has been extensive, and where higher education has grown greatly, far more people have some informal contact with graduates than would have been possible in, say, the 1940s.

On intelligence, the findings of previous research with the 1958 and 1970 cohorts suggest that the effect became weaker in the younger cohort. But we have seen that the 1958 cohort probably exhibited a stronger effect of intelligence than either of the other two. The reason may have been that, in the first wave of higher-education expansion that started in the late-1960s, people with the highest measured intelligence benefited first. But the change in gradient with respect to intelligence was stronger for attaining any higher education than it was for degrees, so that the main way in which people of below-average intelligence benefited from the expansion as they aged was through taking sub-degree courses (question 5).

We thus have three broader conclusions. One is methodological: in trying to understand how access to higher education is socially stratified, it can be illuminating to look beyond young ages. Second, sex differences are cohort effects, taking advantage of period effects in policy: for example, the 1990s expansion affected sex differences only in the 1970 cohort.

Third, on social class, although inequality, controlling for intelligence, was similar between the cohorts at quite young ages, there is evidence that, in the 1970 cohort,

courses taken beyond age 30 compensated to a greater extent than in the older cohorts for that early disadvantage. But that was true only of higher-education attainment as a whole. For degree-level attainment, there was no evidence of any such compensation. The apparently anomalous experience of women from class IV may be explained by a suggestion made by Breen et al. (2010: 33). That class consists mainly of self-employed owners of small businesses or farms, who have not traditionally passed on the business to daughters. Therefore education was important for daughters of that class more than for sons.

These patterns seem amenable to summary in terms of two influential theories of educational stratification. The theory of maximally maintained inequality (Raftery and Hout, 1993) proposes that, during periods of expansion, the most advantaged social groups initially take most of the new places available, and that other groups catch up only when expansion goes beyond the point at which the advantaged groups are unable to expand their particpation further. Similar ideas have been proposed by Brown (2013), pointing out that middle-class parents have the knowledge of how merit-selection works that enables them to maintain their children's advantage. Effectively maintained inequality (Lucas, 2001) suggests what happens after that point. When the other groups do start to catch up, the most advantaged classes congregate in a particular segment of the expanding level of education, giving it higher social prestige.

There two clear instances in our analysis which show the operation of maximally maintained inequality. The initial step of that process – when the most advantaged class moves ahead – was particularly clear for the 1958 cohort, where the attainment of any higher-education qualification by the two highest classes rose at age 30 to a level that did not rise much further even in the youngest cohort (Figure 5). The subsequent step in the process of maximally maintained inequality then came in the 1970 cohort, when the rise of attainment of any higher-education qualification among lower-class people was greater than the rise for higher classes, leading to a weakening of the class gradient (Figure 3).

On the other hand, other aspects of these same processes may be described as instances of effectively maintained inequality. High class people in the 1958 cohort relied mainly on sub-degree courses for their improving participation: the 1958 lines in Figure 5 (for all higher education) are much further ahead of the 1936 line than they are for degrees in (Figure 6). But their successors in the 1970 cohort owed their growing participation mainly to degrees (the similarity of the 1970 lines in these graphs). That is an example of effectively maintained inequality because it shows an advantaged social group making greater use of one segment (degrees) of an officially common experience. Other research has shown that choice of institution became an aspect of effectively maintained inequality, school-leaver entrants' preferring the oldest universities (Iannelli et al., 2011). Egerton and Halsey (1993: 188) found that this social-class differentiation of institutional type happened only for people entering soon after leaving school; by implication, therefore, entering earlier rather than later was itself a way in which the advantage of high social classes was maintained. Other research has found that social differentiation also related to the subjects that students took. Purcell et al. (2008: 55-6) showed –from data for the whole of the UK – that the pattern of subject choice varied by the age of the student and by their socio-economic status. Our data do not have information on institutions or on subjects studied, but the suggestion here is that older students from lower-class origins would tend to study

different kinds of subject in different kinds of university from younger students of higher-class origins.

On balance, it seems more reasonable to conclude that the main process here is the maintenance of inequality by diverse means – in other words, Lucas's theory – simply because education always provides a variety of dimensions along which differentiation is feasible. At various periods and ages, these could be level of higher education, institution, or subject. Our conclusion on this would then be that policy and social change do not have uniform effects on inequality. The general expansion of the 1990s at first widened inequality for entrants directly from school (Iannelli et al., 2011). But the present analysis (Figure 3) shows that it had no effect on inequality for students in the 1958 cohort, and by 2012 had reduced class inequality for students born in 1970. So that ambiguity is our final conclusion. Considering higher education across the lifecourse shows that inequality in any particular period might move in contradictory directions for people born at different times. That kind of conclusion would no doubt be frustrating for policy makers. It also raises questions about any strong sociological theories about how inequality is, or is not, maintained.

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Tables and graphs

Table 1

Distribution of origin class, 1936, 1958 and 1970 cohorts

(a) Including unclassified group

Goldthorpe class (% in columns)	1936 cohort	1958 cohort	1970 cohort
I	1.3	9.0	4.3
II	4.4	2.6	11.3
III	6.0	4.6	6.7
IV	3.4	4.0	3.2
V	1.6	2.0	6.8
VI	24.1	44.0	34.6
VII	37.0	26.1	23.7
Unclassified	22.2	7.6	9.5
Sample size	2,531	1,985	1,617

(b) Not including unclassified group

Goldthorpe class (% in columns)	1936 cohort	1958 cohort	1970 cohort
I	1.7	9.8	4.7
II	5.6	2.8	12.4
III	7.7	5.0	7.4
IV	4.4	4.4	3.5
V	2.1	2.1	7.5
VI	30.9	47.7	38.2
VII	47.6	28.2	26.2
Sample size	1,969	1,834	1,463

Note: Origin class is measured by the Goldthorpe scheme at age 3 in the 1936 cohort and at birth in the 1958 and 1970 cohorts.

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.

Table 2

Longitudinal models, within respondent, of attaining a higher-education qualification, 1958 cohort

Analysis of deviance

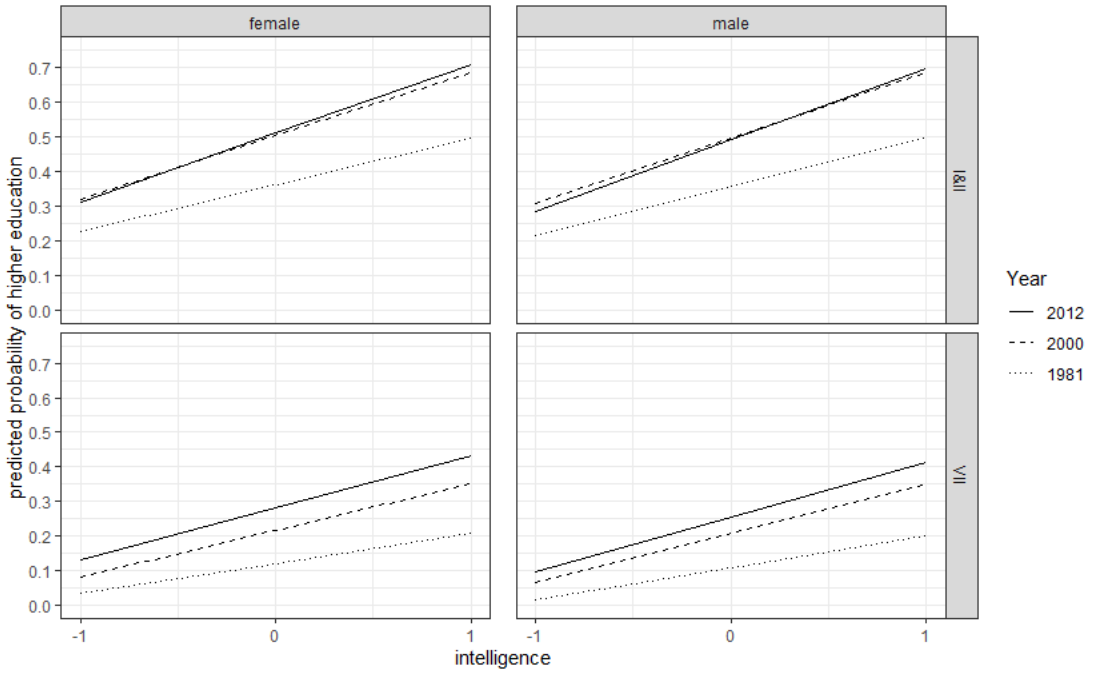
Terms in the model	Degrees of freedom	Reduction in deviance
Year, intelligence, sex, origin class	12	872**
+ year.intelligence	5	86.4**
+ year.sex	5	13.8*
+ intelligence.origin	5	1.95
+ intelligence.sex	1	0.09
+ origin.sex	5	1.49
+ year.origin	25	23.0
Variance components in final model		
Betweeen respondents		0.141
Within respondents		0.028
Sample size (no. respondents)		1,208

Years are 1981, 1991, 2000, 2004, 2008 and 2012.

*Key for statistical significance levels: ** $p<0.01$; * $0.01<p<0.05$; (*) $0.05<p<0.10$.*

Source: National Child Development Study.

Figure 1
Predicted proportion attaining a higher education qualification,
by selected classes, sex, intelligence, and selected years, from final model in Table 2
1958 cohort



Intelligence is scaled as standard deviations from the mean. Origin class is measured by the Goldthorpe scheme.

Source: National Child Development Study.

Table 3

Longitudinal models, within respondent, of attaining a higher-education qualification, 1970 cohort

Analysis of deviance

Terms in the model	Degrees of freedom	Reduction in deviance
Year, intelligence, sex, origin class	11	484**
+ year.intelligence	4	1.50
+ year.sex	4	8.36(*)
+ intelligence.origin	5	2.96
+ intelligence.sex	1	0.06
+ origin.sex	5	2.60
+ year.origin	20	30.0(*)
+ sex.year.origin	20	34.3*
Variance components in final model		
Betweeen respondents		0.170
Within respondents		0.028
Sample size (no. respondents)		945

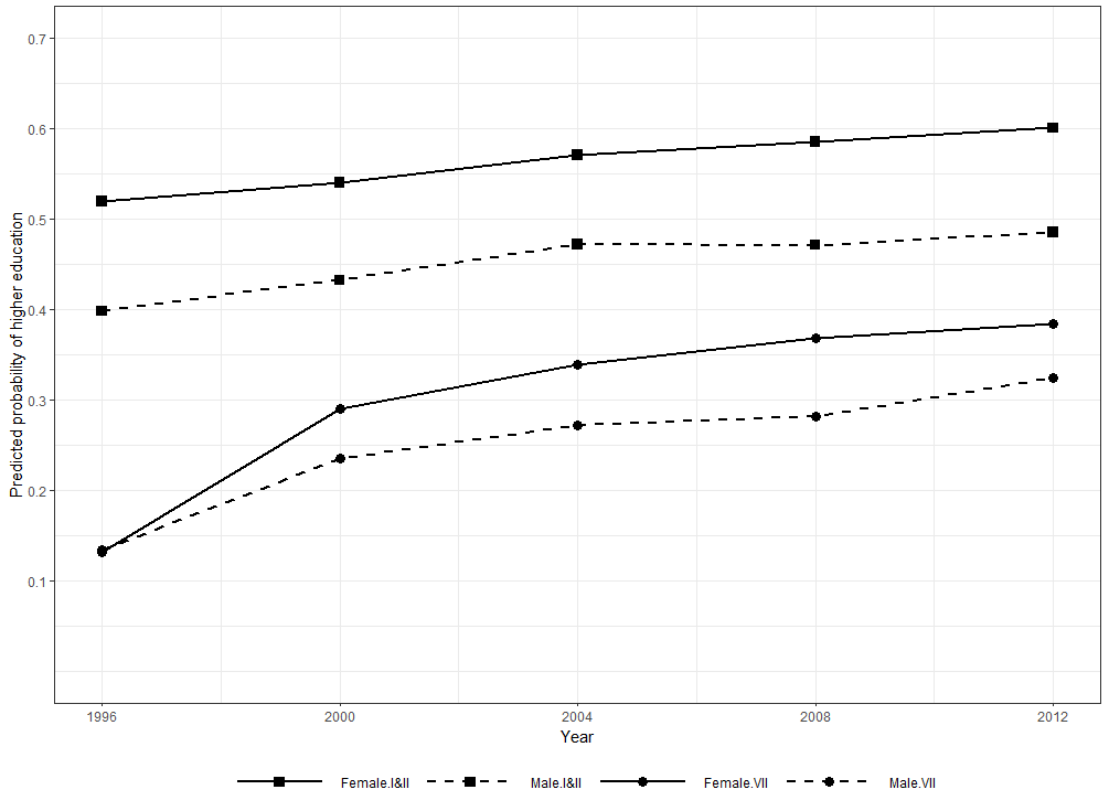
Years are 1996, 2000, 2004, 2008 and 2012.

*Key for statistical significance levels: ** $p<0.01$; * $0.01<p<0.05$; (*) $0.05<p<0.10$.*

Source: British Cohort Study.

Figure 2

Predicted proportion attaining a higher education qualification, by year, sex, and selected origin class, from final model in Table 3
1970 cohort



Values for intelligence=0 (the mean).

Origin class is measured by the Goldthorpe scheme.

Source: British Cohort Study.

Table 4

Longitudinal models of attaining a higher-education qualification, 1936, 1958 and 1970 cohorts

Analysis of deviance

Terms in the model	Degrees of freedom	Reduction in deviance
Cohort, year, intelligence, sex, origin	11	1538**
+ cohort.year	4	48.6**
+ cohort.intelligence	2	39.9**
+ cohort.sex	2	24.7**
+ intelligence.sex	1	3.13(*)
+ intelligence.origin	5	18.4**
+ year.sex	2	9.60**
+ year.intelligence	2	20.8**
+ sex.origin	5	3.74
+ cohort.origin	10	15.9
+ year.origin	10	8.78
+ cohort.year.origin	20	40.0**
Variance components in final model		
Betweeen respondents	0.105	
Within respondents	0.032	
Sample size (no. respondents)	3,724	

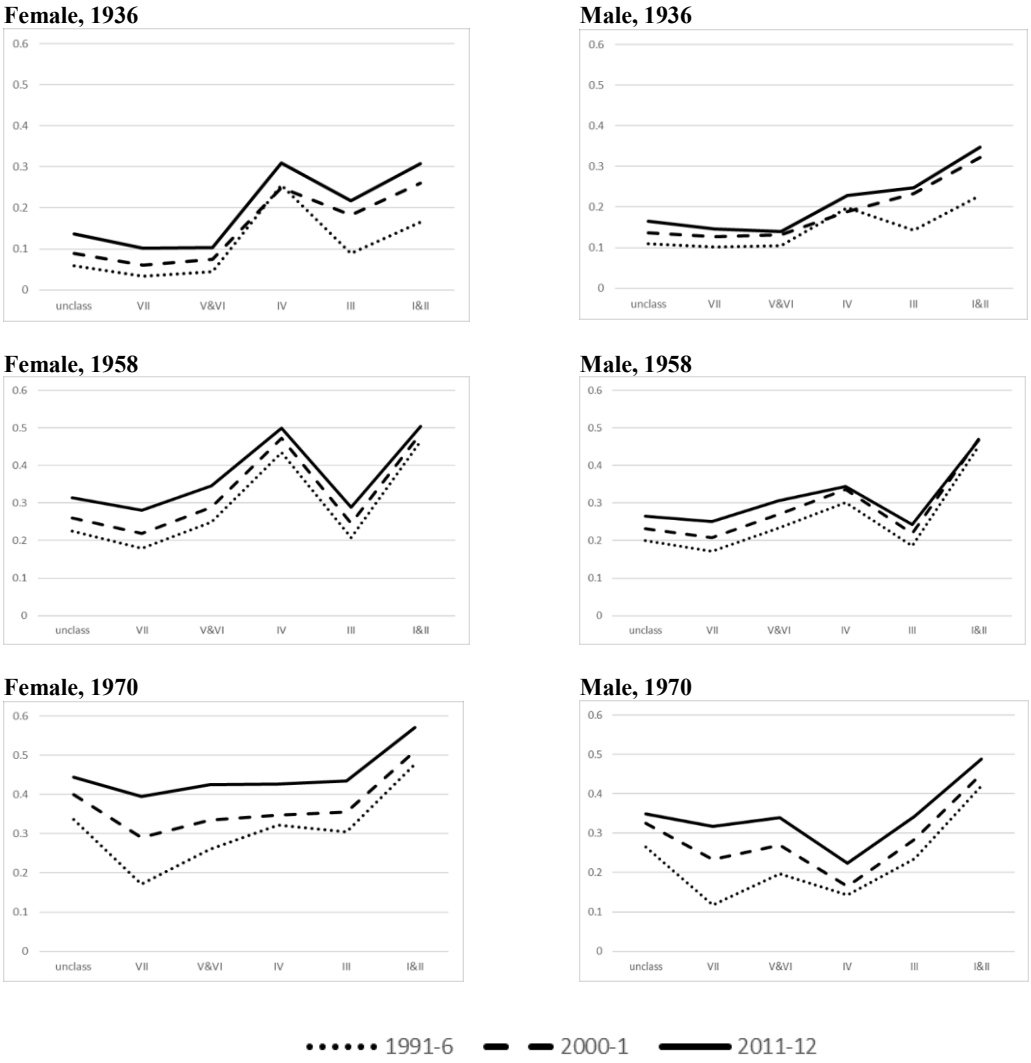
Years are 1991-6, 2000-2001, and 2011-2012. Sample sizes: 1936, 1,571; 1958, 1,208; 1970, 945.

*Key for statistical significance levels: ** $p<0.01$; * $0.01<p<0.05$; (*) $0.05<p<0.10$.*

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.

Figure 3

Predicted proportion attaining a higher-education qualification, by origin class, cohort, year and sex, for people of mean intelligence within cohort, from final model in Table 4

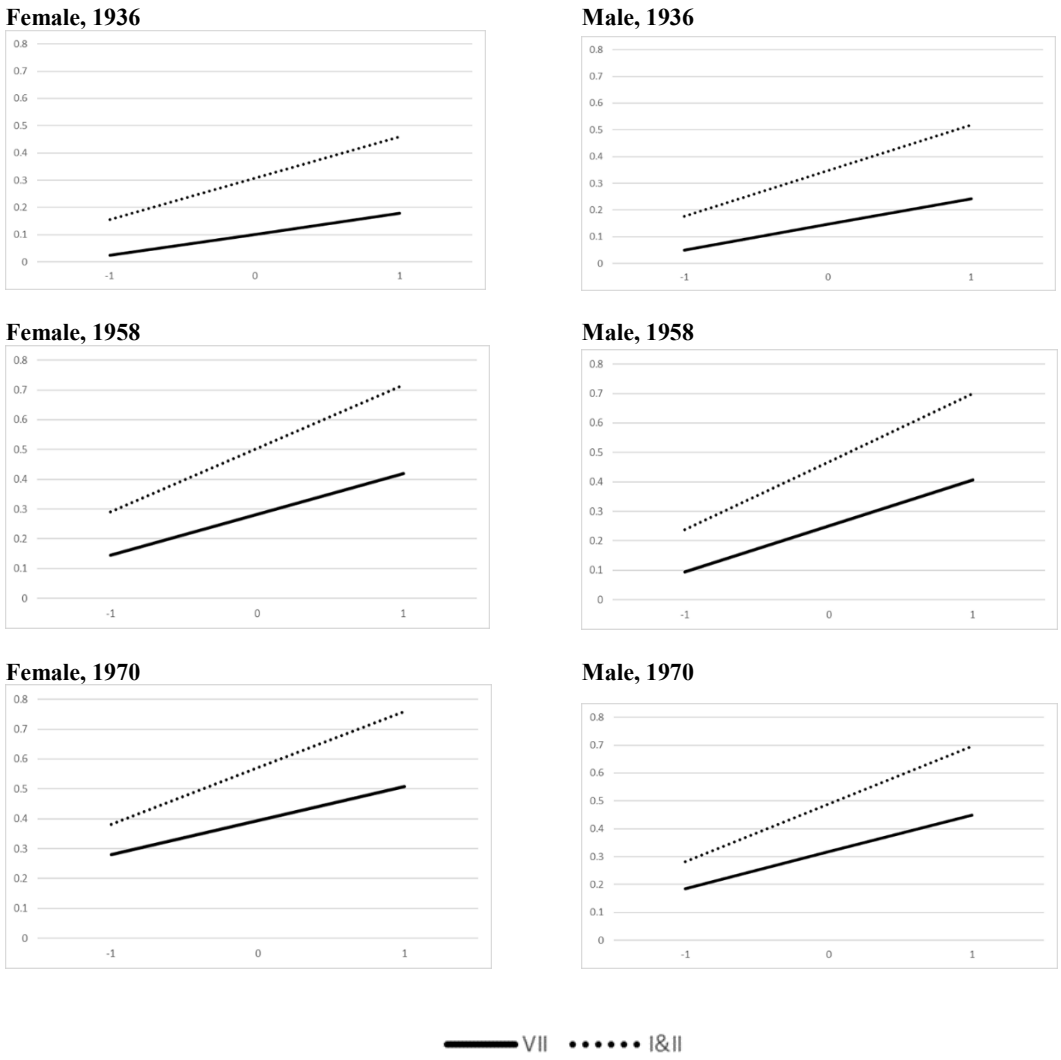


Origin class is measured by the Goldthorpe scheme.

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.

Figure 4

Predicted proportion attaining a higher-education qualification in 2011-12, by cohort, sex, intelligence, and selected origin class, from final model in Table 4



Intelligence (horizontal axes) is scaled as standard deviations form the mean. Origin class (legend) is measured by the Goldthorpe scheme.

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.

Table 5

Models of attaining a higher-education qualification at age c. 30: 1936, 1958 and 1970 cohorts

Analysis of variance

Terms in the model	Degrees of freedom	F value
Cohort	2	106.9**
Intelligence	1	560.6**
Origin class	5	26.4**
Sex	1	5.33*
Cohort.intelligence	2	4.27*
Cohort.origin	10	0.85
Cohort.sex	2	1.80
Residual	3,068	

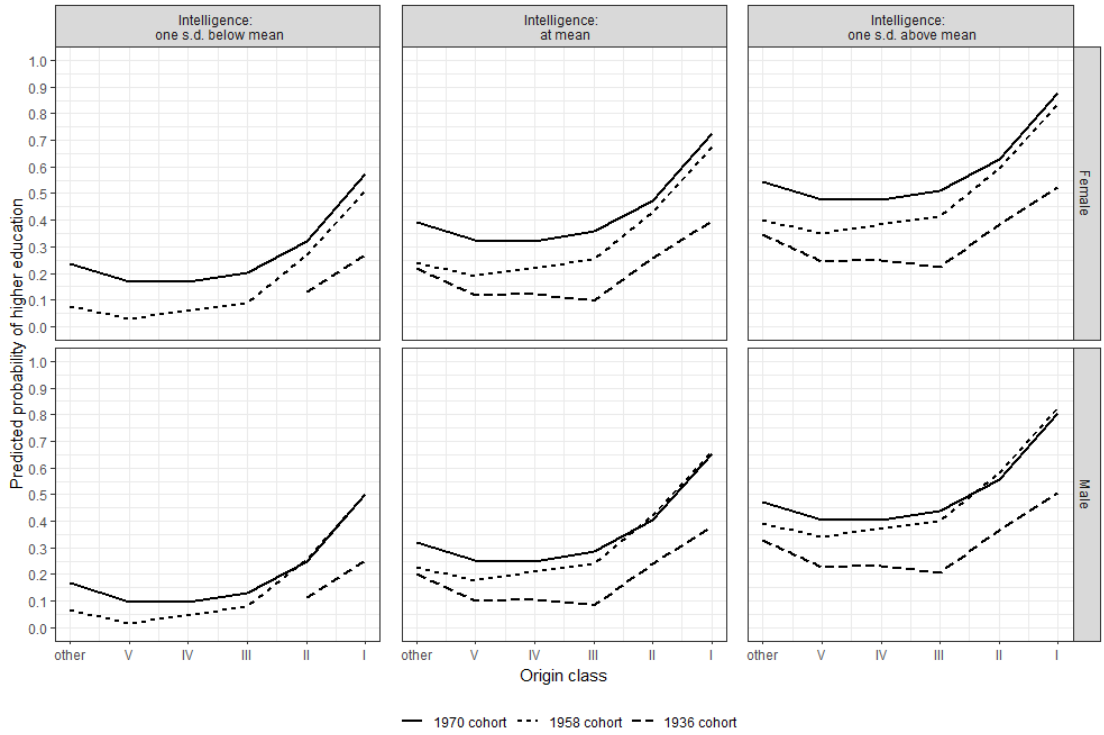
Ages are 27 in 1936 cohort, 33 in 1958 cohort, and 30 in 1970 cohort. Sample sizes: 1936, 1,201; 1958, 995; 1970, 896.

*Key for statistical significance levels: ** $p<0.01$; * $0.01<p<0.05$; (*) $0.05<p<0.10$.*

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.

Figure 5

Predicted proportion attaining a higher education qualification, by intelligence, sex, and origin class, from full model in Table 5 (age c. 30)



Origin class is measured by the Registrar General scheme.

The sample numbers attaining a higher-education qualification in the 1936 cohort at lower intelligence in classes below I and II were too small to give valid estimate; these correspond to the absent data points in the left-hand graphs

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.

Table 6

Models of attaining a higher-education qualification at age 42: 1958 and 1970 cohorts

Analysis of variance

Terms in the model	Degrees of freedom	F value
Cohort	1	32.4**
Intelligence	1	352.4**
Origin class	5	13.7**
Sex	1	8.02**
Cohort.intelligence	1	2.32
Cohort.origin	5	1.34
Cohort.sex	1	2.20
Residual	2,107	

Sample sizes: 1958, 1,178; 1970, 945.

*Key for statistical significance levels: ** $p<0.01$; * $0.01<p<0.05$; (*) $0.05<p<0.10$.*

Sources: National Child Development Study and British Cohort Study.

Table 7
Models of attaining a higher-education qualification at age c. 55: 1936 and 1958 cohorts
Analysis of variance

Terms in the model	Degrees of freedom	F value
Cohort	1	430**
Intelligence	1	489**
Origin class	5	20.8**
Sex	1	1.56
Cohort.intelligence	1	63.8**
Cohort.origin	5	1.32
Cohort.sex	1	13.6**
Residual	3,281	

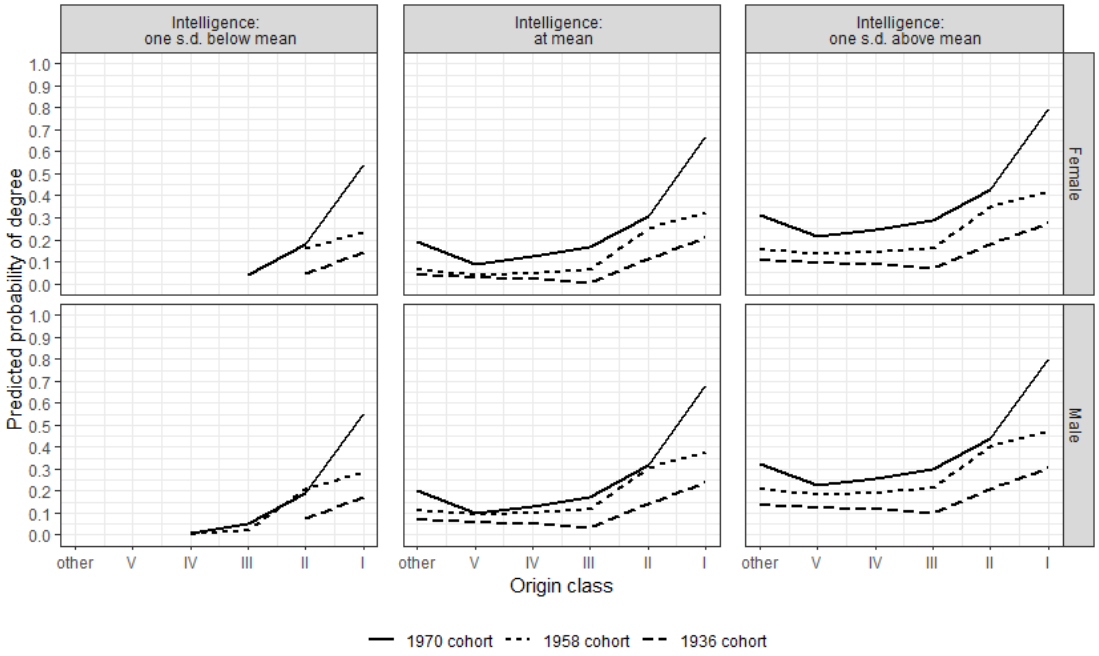
Sample sizes: 1936, 2,089; 1958, 1,208.

*Key for statistical significance levels: ** $p<0.01$; * $0.01<p<0.05$; (*) $0.05<p<0.10$.*

Sources: Scottish Longitudinal Study and National Child Development Study.

Figure 6

Predicted proportion attaining a degree, by intelligence, sex, and origin class (age c. 30)



Origin class is measured by the Registrar General scheme.

The sample numbers attaining a degree in the 1936 cohort at lower intelligence in several lower classes were too small to give valid estimates: these correspond to the absent data points in the left-hand graphs.

Sources: Scottish Longitudinal Study, National Child Development Study and British Cohort Study.